



Cardiovascular Disease Among Women Residing in Rural America: Epidemiology, Explanations, and Challenges

Many believe that the United States has entered a “Golden Age” of cardiovascular health and medicine. Pharmacological and technological advances have indeed produced an era of declining mortality rates from cardiovascular diseases for the nation as a whole. However, there remain areas of challenge.

Cardiovascular disease (CVD) is still by far the leading cause of death and disability in the United States, and it is the leading killer of US women. Perhaps the single most notable feature of the CVD epidemic in the United States is the substantial difference in morbidity and mortality that exists between White women and women of color, with a disproportionate share of suffering borne by minority women. Unexplained regional variations also cloud the otherwise notable progress of the last 30 years, and many rural areas appear to be uniquely affected by cardiovascular disease.

This commentary reviews the evidence that the CVD epidemic disproportionately burdens women of color who reside in rural areas, itemizes and provides a logical framework for explaining this burden, and suggests approaches to solving this vexing public health problem. (*Am J Public Health*. 2002;92:548-551)

THE TURN OF THE 21ST

century is considered by many leaders in medicine to mark the beginning of a “Golden Age” of American cardiovascular medicine and health. There are many reasons for this opinion. The results of landmark population-

based studies like the renowned Framingham Study have accumulated steadily over the last 5 decades, leading to a far clearer understanding of the causes of cardiovascular diseases than was available a generation ago. The epidemiological identification of

Herman A. Taylor, MD, Gail D. Hughes, DrPH, MPH, and Robert J. Garrison, PhD

risk factors for various manifestations of cardiovascular disease has stimulated and complemented a large body of other research. Basic science investigations, clinical research, including large randomized clinical trials, and behavioral studies have helped elucidate mechanisms that explain the predictive power of the known risk factors and have guided the development of effective preventive strategies. Increasingly efficacious intervention strategies for manifest disease have developed in parallel.^{1,2} These methodologically diverse lines of inquiry, testing, and development have yielded substantial health gains for the United States as a whole. If the CVD epidemic had continued at its peak rate (reached in 1963), 1 098 000 Americans

would have died in 1996. Instead, fewer than 500 000 died and more than half a million lives were spared.

The widening array of preventive and therapeutic tools of modern medicine, along with selective adoption of healthier habits, can be credited as the cause of these substantial declines in CVD mortality.^{3,4} Most conspicuous among the sweeping behavioral changes is the impressive decline in smoking among American adults, particularly White men, in recent decades. Smoking rates have dropped from 40% in the mid-sixties to approximately 25%, according to recent surveys.⁵ In the arena of medical therapy, the development of safe and effective therapies for hypertension have led to major gains in

prevention of CVD mortality.⁶ Evidence-based therapies for manifest cardiac and cerebrovascular diseases (such as beta blockers and ACE inhibitors) have contributed to the secondary prevention of disease progression and the reduction in death rates. Established innovations (e.g., coronary care units, cardiac monitoring, coronary artery bypass surgery) and practices (e.g., cardiac rehabilitation) have combined with newer advances to significantly reduce mortality and morbidity from the leading specific cause of cardiovascular death, coronary disease.^{1,7} Many of these same therapies have been proven effective or are under investigation, in the management of stroke.^{2,8–13}

Despite the clearly positive trends in CVD mortality and morbidity, African American women in rural areas have distinctly elevated mortality rates. Among the counties where estimates are available for Black women, heart disease mortality ranged from 124 to 1275 per 100 000—a 10-fold difference between the lowest and highest county rates. Many of the counties with the highest rates are rural, with low population density, and are located in the Mississippi River Delta. There are other distinct rural areas of high mortality, including southwestern Oklahoma and west central Texas. Low rates of heart disease mortality for rural-dwelling Black women are found in east Texas and northern Florida.

A final set of ethnicity–geography comparisons will lend added perspective to these findings. African American women, taken as a whole, have the highest heart disease mortality among US women. Indeed, rural

African American heart disease mortality is among the highest ever recorded anywhere in the world.

Mississippi has both the highest proportion of rural-dwelling African American women and the highest heart disease death rate, 11% higher than that of Nebraska, the next highest rate, and more than twice the rate of the states with the lowest heart disease mortality, such as Minnesota. It is important to note that large numbers of African American women live in rural areas, particularly in the southern United States. This fact, combined with the high death rates, results in a substantial burden of mortality.

MECHANISMS THAT EXPLAIN GEOGRAPHIC DISPARITIES

Much has been written about the ethnicity- and poverty-associated disparities in mortality in the United States.^{14–16} Yet, identifying underlying causes for these astounding differences, in the most prosperous nation in man's history, continues to challenge researchers. Although our knowledge base is woefully incomplete in this matter, many factors likely account for the American mosaic of CVD mortality.

In contrast to the idealized view of “country life” as active, not stressful, and replete with healthy foods and strong social and community support, the lives of rural Americans are more typically beset with a daunting array of obstacles to health maintenance. Structural barriers to health include high levels of poverty, maldistribution of health care workers, absent or inadequate health infrastructure, remote location, and

social isolation, particularly among the elderly and, most often, female rural Americans. Low socioeconomic status has been shown repeatedly to correlate with low levels of knowledge about health maintenance, poor access to preventive care, and reliance on emergency departments or other episodic, discontinuous sources for primary care.^{14–16} These factors typify health care for the poor, regardless of locale.

In addition to these structural risk factors (and in some cases because of them), rural Americans appear to have higher frequencies of the “classical” risk factors. In a community-based study done by Willems et al. in two rural Virginia counties, the prevalence of diabetes (15.6%), sedentary lifestyle (66.7%), and obesity (64.7%) was highest among rural-dwelling African American women.¹⁷ A cross-sectional study of urban and rural women's leisure-time physical activity found African American and Native American women in Missouri 35% and 65% more likely, respectively, to be totally inactive than were their White counterparts.^{17–20} Rural minorities were at greatest risk for sedentary lifestyles. The combination of minority status and rural residence may have a particularly negative impact on coronary heart disease risk factors.

Available data suggest that women in general may receive suboptimal care for acute CVD. Data on the diagnosis and management of coronary heart disease illustrate the disparity in treatment.^{21–23} When women arrive at a hospital, treatments and procedures are often delayed or not made available. Women are less likely to receive an electro-

cardiogram and electrocardiogram monitoring, less likely to be admitted to a coronary care unit, and less likely to receive a cardiology consultation. African American women are much less likely than men or White women to have access to lifesaving therapies for heart attack. Most of the 1 million US patients who have heart attacks each year are candidates for reperfusion therapy (reopening of blocked arteries), either thrombolytic drugs or primary angioplasty. African American women, however, are least likely to receive reperfusion therapy (44%), followed by African American men (50%), White women (56%), and White men (59%).²⁴ A study by Schulman et al. also found a substantial reduction in odds of referral for cardiac catheterization for African American women.²⁵

These findings suggest that there are salient explanations for the mosaic pattern of CVD death in the United States and that changing this pattern presents enormous challenges that will not be easily met. Ensuring equitable access to health care is an important public policy goal, however, and a significant body of research and policy analysis has been focused on documenting barriers to access for vulnerable populations and suggesting policy options to eliminate such barriers.²⁶

Rural populations have often been viewed as especially vulnerable with respect to health care access. Poorly developed and fragile health infrastructures, socioeconomic hardships, and physical barriers such as distance and unavailability of transportation all contribute to limiting access in rural areas. Problems in access to care for CVD are parallel for urban and rural women. But the

magnitude of the problems is greater for rural women because of isolation, lower socioeconomic status, and lack of resources. Rural residents are more likely to suffer from chronic disease such as CVD; at the same time, the low proportion of CVD specialists in rural areas is of particular concern with regard to access to care. For example, over 80% of the counties in Mississippi have no physicians who specialize in CVD. Lack of medical care resources such as coronary care unit beds and cardiac rehabilitation units also limit opportunities for CVD intervention and treatment. An analysis of services to Medicare beneficiaries found that the volume of cardiology services for the rural Medicare enrollees was 40% lower than for urban beneficiaries as a result of the lower volume of physician services per beneficiary (15%) in rural areas, especially for technology-intensive procedures.²⁷

For those not covered by Medicare, lack of affordable access is a major barrier to adequate and timely health care. Different patterns of insurance coverage and employment patterns are seen in rural residents.²⁸ They are more likely to be self employed and unable to afford private insurance. When rural residents are employed by a firm, the firm is usually small, does not pay for medical leave, and generally either is unable to provide comprehensive health insurance or offers no insurance coverage at all. The inhabitants of rural areas tend to have lower rates of private insurance coverage and higher rates of public insurance coverage than do residents of more populated areas.

Adequate health literacy is very important to motivate any behavioral modification neces-

sary for good cardiovascular health.²⁹ Individual beliefs about the effectiveness of health care, and feelings of trust toward medical professionals, may affect use of health care services among rural populations. The absence of adequate prevention resources, such as safe and affordable physical activity programs, access to healthy and affordable food sources, and health insurance reimbursement for preventive services, is also an impediment to CVD prevention.

IMPROVING CARDIOVASCULAR HEALTH IN RURAL AMERICA

Four strategies could, if implemented, improve the cardiovascular health of women who live in rural America. While the strategies are interrelated, they can be viewed as distinct in a logical framework, each requiring their own set initiatives, infrastructure, and skill base.

Broad-Based Prevention

To identify and treat secondary (metabolic) causes of CVD including hypertension, diabetes, and dyslipidemia, it is necessary to address issues affecting access to high-quality health care. Insurance coverage; sufficient numbers of local health care providers, including CVD specialists; transportation; and continued education among providers and in the community must be offered in a gender specific and culturally appropriate manner. Intervention regarding primary causes of CVD, such as overnutrition (related to overweight and obesity) and cigarette smoking, is also essential. Information must be disseminated in various forms and by various means with re-

spect to diversity of gender, age (young versus old), and ethnicity. Education and dissemination of information among health care providers, patients, communities, and policymakers (legislators, public health officials, health policymakers, and health insurance agencies) are critical.

Policy Adjustments

Lack of insurance coverage is a major barrier to access, and creating policy to remove this barrier and improve access is crucial for the well-being of the rural populace. Given the variable employment patterns and less employer-based insurance in rural communities, state high-risk insurance plans to provide coverage to the rural residents would be an asset. Since 1997, active insurance pools have operated in 26 states, and 7 states have provided an alternative to private insurance through BlueCross BlueShield associations; however, the conversion of these associations to for-profit entities will decrease the number of states that provide open enrollment with affordable premiums. Unfortunately, data on the numbers of rural residents who have enrolled in these programs are not available.

Outreach Initiatives

The Jackson Heart Study is an observational epidemiological study investigating environmental and genetic factors that influence the progression of CVD in African Americans. The study's target sample consists of 6500 participants in 3 counties, including both metropolitan and nonmetropolitan geographic areas. The study will provide premier information regarding cardiovascular disease among African Americans in addition to providing

models for community outreach and education.

Future Research

The model of a causal sequence from lifestyle to CVD shows a linear relationship between behavioral risk factors, metabolic risk factors (dyslipidemia, type II diabetes, and hypertension), and cardiovascular events (coronary heart disease, cerebrovascular accident, congestive heart failure, and end-stage renal disease). Modifications of this model must include the environmental and social causation factors related to racism, sexism, discrimination, as well as specific cultural dynamics such as spirituality, place of birth, migration patterns, and acculturation.

Consideration must be given to designing long-term strategies that take into account the influence of socioeconomic status and cultural beliefs on individual perceptions of health and willingness to adopt lifelong behavioral modifications. More important, policymaking must progress beyond discussion of "thinking out of the box" to a paradigmatic shift in the axiology, methodology, implementation, and evaluation of efforts focused on rural minority women. This shift should come from community input and from experienced researchers with an understanding of key issues and challenges for rural women.

SUMMARY

Ethnicity, gender, and geography are powerful modifiers of health in this country. It is possible that *geography is more powerful than any risk factor yet to be discovered*. The proximate influences on health that are tied to race may include socioeconomic status, education, biological risk

factor prevalence, health-seeking behaviors, inequities in health care delivery systems, unique stressors tied to ethnic minority status, and genetic predisposition, as well as other factors yet to be postulated. Geographic concentration of disease burden, likewise, may have many causes, including inadequate health care infrastructure, remote location, and environmental exposures unique to a given locale infectious diseases and other possibilities. These multidimensional influences interact in a way that causes CVD mortality statistics to range absurdly from one region to the next, and from one racial group to the next, among ethnic groups that constitute one nationality—the American nationality.

The root causes of such huge disparities are clearly many. Resolution of these inequities will require comprehensive action strategically appropriate to the affected groups. Mere extrapolation of research findings and efficacious practices relevant to one group will not suffice and may be naïve at best, counterproductive at worst. Efforts to resolve health inequities must be informed by thoughtful, focused, and comprehensive research conducted among the target populations. ■

About the Authors

The authors are with the Jackson Heart Study, Jackson, Miss.

Requests for reprints should be sent to Herman A. Taylor, MD, Jackson Heart Study, 350 West Woodrow Wilson Dr, Suite 701, Jackson, MS 39213 (e-mail: herman.a.taylor@ccaix.jsums.edu).

This commentary was accepted January 2, 2002.

Contributions

All three authors contributed substantially to the writing of this paper. H. Taylor and G.D. Hughes presented sections of this article at the Galveston conference and R.J. Garrison con-

tributed substantial editorial review for the final article.

References

1. Califf RM et al. Prediction of 1-year survival after thrombolysis for acute myocardial infarction in the global utilization of streptokinase and tPA for occluded coronary arteries trial. *Circulation*. 2000;101:2231–2238.
2. Katzan IL et al. Use of tissue-type plasminogen activator for acute ischemic stroke: the Cleveland area experience. *JAMA*. 2000;283:1151–1158.
3. Levy RI, Moskowitz J. Cardiovascular research: decades of progress, a decade of promise. *Science*. 1982;217:121–129.
4. Stamler J et al. Primordial prevention of cardiovascular disease risk factors: panel summary. *Prev Med*. 1999;29:S130–S135.
5. Centers for Disease Control and Prevention. Cigarette smoking among adults—United States, 1998. *JAMA*. 2000;284:2180–2181.
6. The sixth report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Arch Intern Med*. 1997;157:2413–2446.
7. Sadanandan S, Hochman JS. Early reperfusion, late reperfusion, and the open artery hypothesis: an overview. *Prog Cardiovasc Dis*. 2000;42:397–404.
8. Meschia JF. Management of acute ischemic stroke: what is the role of tPA and antithrombotic agents? *Postgrad Med*. 2000;107:85–93.
9. Davenport J et al. tPA: a rural network experience. *Stroke*. 2000;31:1457–1458.
10. Albers GW et al. Intravenous tissue-type plasminogen activator for treatment of acute stroke: the Standard Treatment with Alteplase to Reverse Stroke (STARS) study. *JAMA*. 2000;283:1145–1150.
11. Alexandrov AV et al. High rate of complete recanalization and dramatic clinical recovery during tPA infusion when continuously monitored with 2-MHz transcranial doppler monitoring. *Stroke*. 2000;31:610–614.
12. Tanne D et al. Intravenous tissue plasminogen activator for acute ischemic stroke in patients aged 80 years and older: the tPA stroke survey experience. *Stroke*. 2000;31:370–375.
13. Wang DZ et al. Treating acute stroke patients with intravenous tPA. The OSF stroke network experience. *Stroke*. 2000;31:77–81.
14. Rogot E, Sorlie PD, Johnson NJ. Life expectancy by employment status, income, and education in the National Longitudinal Mortality Study. *Public Health Rep*. 1992;107:457–461.
15. Sorlie P et al. Black–white mortality differences by family income. *Lancet*. 1992;340:346–350.
16. Winkleby MA, Fortmann SP, Rockhill B. Trends in cardiovascular disease risk factors by educational level: the Stanford Five-City Project. *Prev Med*. 1992;21:592–601.
17. Willems JP et al. Prevalence of coronary heart disease risk factors among rural blacks: a community-based study. *South Med J*. 1997;90:814–820.
18. Brownson RC et al. Preventing cardiovascular disease through community-based risk reduction: the Bootheel Heart Health Project. *Am J Public Health*. 1996;86:206–213.
19. Brownson RC et al. Support for policy interventions to increase physical activity in rural Missouri. *Am J Health Promot*. 1998;12:263–266.
20. Brownson RC et al. Promoting physical activity in rural communities: walking trail access, use, and effects. *Am J Prev Med*. 2000;18:235–241.
21. Canto JG et al. Presenting characteristics, treatment patterns, and clinical outcomes of non-black minorities in the National Registry of Myocardial Infarction 2. *Am J Cardiol*. 1998;82:1013–1018.
22. Taylor HA, Jr. et al. Management and outcomes for black patients with acute myocardial infarction in the reperfusion era. National Registry of Myocardial Infarction 2 Investigators. *Am J Cardiol*. 1998;82:1019–1023.
23. Taylor HA et al. Race and prognosis after myocardial infarction. Results of the thrombolysis in myocardial infarction (TIMI) phase II trial. *Circulation*. 1993;88:1484–1494.
24. Canto JG et al. Relation of race and sex to the use of reperfusion therapy in Medicare beneficiaries with acute myocardial infarction. *N Engl J Med*. 2000;342:1094–1100.
25. Schulman KA et al. The effect of race and sex on physicians' recommendations for cardiac catheterization. *N Engl J Med*. 1999;340:618–626.
26. Raphael D. Health inequities in the United States: prospects and solutions. *J Public Health Policy*. 2000;21:394–427.
27. Dor A, Holahan J. Urban–rural differences in Medicare physician expenditures. *Inquiry*. 1990;27:307–318.
28. Frenzen PD. Health insurance coverage in US urban and rural areas. *J Rural Health*. 1993;9:204–214.
29. Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs, American Medical Association. Health literacy: report of the Council on Scientific Affairs. *JAMA*. 1999;281:552–557.